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BETTER GINNING TO ENHANCE COTTON QUALITY AND UTILITY

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Better ginning can be done in many gins in the United States. Smooth, high quality cotton from some of the gins of yesterday flowed to the market. This cotton was grown and ginned by careful growers who permitted no rush of time to swerve them from obtaining high grades. Not all producers, of course, took such pains, but "Middling Fair" was an actual and attainable grade. Proper picking, careful conditioning in sunshine or storage, good ginning -- these were performed by them under many handicaps that now do not exist, or, at least, do not prevail to the degree that they did in the past century.

Yesterday, so to speak, the farm and plantation practices were simpler than now because: (1) tillage and production machinery was either crude or lacking; (2) many varieties of today were then non-existent; (3) slick-seed cottons were to be found among upland varieties as well as in sea-island cottons; (4) harvesting and handling were performed by hand; (5) ginning power was often variable in speed and was inefficient; (6) presses were made of wood; and (7) bales frequently were partially compressed bundles of packed fiber. It is true, however, that many of the cotton varieties then grown were quite uniform. A fifty-year-old sample recently displayed at the U. S. Cotton Ginning Laboratory indicated an excellent uniformity.

The Cotton Ginning Laboratory of the United States Department of Agriculture is jointly operated at Stoneville, Mississippi by the Bureau of Agricultural Chemistry and Engineering and the Agricultural Marketing Service. This laboratory endeavors to serve the entire Cotton Belt and is concerned with all phases of cotton which deal especially with the varied processes pertaining to ginning. It has studied and sought to perpetuate good methods and practices and to discard bad ones. It is one of several active agencies engaged in scientific research and the applied developments arising therefrom have resulted in greatly improved practices.

The requirements of the consumer are quite clearly reflected in the market demands for the various established grades, which indicate their respective utility. In general the higher quality, better ginned cottons yield greater returns to producers.

In considering the essentials by which cotton quality and utility may be enhanced, it should be self-evident that large-scale producing and ginning operations are not necessarily a requisite to better ginning. That is to say, small farms and gins, if adequate for their respective regional needs, should be able, by employing good growing and ginning practices, to produce cotton equal in quality to that produced by large farms and gins.

In order to produce higher quality cotton, it is necessary not only to plant good cotton but also to use improved harvesting methods and more care in handling the cotton on the farm. The grower should keep informed as to the performance of cotton varieties with respect to quality, yield and turnout. This information is at his disposal from the tests of State and Federal Experiment Stations. Of special interest and importance to ginners are the ginning characteristics of different kinds of cotton, each of which has its own peculiarities in ease of handling, and in power and time requirements per bale.

The progressive ginners throughout the Cotton Belt are doing much to induce farmers to plant improved varieties of cotton. They have assisted in organizing one-variety communities for the purpose of producing cotton having greater length, greater uniformity and better quality. They recognize that such steps in turn result in marketing advantages, increased stocks of superior planting seed, better harvesting and handling methods and improved ginning practices. The cotton classing service, rendered by the Agricultural Marketing Service of the United States Department of Agriculture, provides important information to grower and ginner alike in such work, and is an increasing aid to single-variety community production.

In connection with the influence which the grower wields in delivering suitable seed cotton to the gin, it should be emphasized at the start that unless the seed cotton is carefully harvested and handled from farm to gin, the quality losses cannot be fully restored. No matter how extensive the gin modernization may be, there is no cleaning, extracting or drying machinery now in use which is effective enough in its action to put roughly harvested, wet cotton in a condition to gin out a sample equal in quality to that ginned from seed cotton carefully and cleanly picked in a dry condition and ginned after handling with ordinary cleaning and feeding equipment.

The necessity for suitable dryness in seed cotton has been emphasized. Cottons under 1-1/16 inch staple length cannot be smoothly ginned without drying, if the moisture content of the seed cotton is more than 14 percent; while staples 1-1/16 inches and longer should not have a moisture content of seed cotton more than 12 percent if good ginning is to be accomplished. These percentages refer to the moisture content of seed cotton and should not be confused with the corresponding percentages for regain of ginned lint, the generally accepted standard of the latter of which is 8-1/2 percent.

Cotton may be dried on the farm or at the gin. The farm methods, quite familiar to the industry, may lack the uniformity of results of the gin driers, but they nevertheless have significant advantages. Artificial drying at the cotton gin is still not fully appreciated or correctly appraised by many cotton producers and buyers, but its use in over 1,340 drier-equipped establishments handling over a million bales of cotton during the past season deserves consideration. The drying process as developed by the United States Department of Agriculture uses about 40 cubic feet of hot air per pound of damp cotton at a safe temperature and with an exposure period dependent upon the agitation which the cotton receives while being dried. Only a few seconds of exposure is required in the driers which fluff and fully agitate the seed cotton during the intermingling with the hot air.

For the usual run of damp or wet cotton, the drying temperatures should not exceed 160 degrees F. Preferably they should not exceed 150°. A slightly higher temperature can be used with very wet cotton, but under no circumstances should it exceed 200°. High temperature "bakes" the cotton, weakens the fiber strength, shortens the staple length, and injures the spinning quality. It is better to pass wet cotton twice through a drier operated at a moderate temperature (150°F.) than once at a temperature above 200°. It slows down the ginning, but many ginners do it to preserve the staple length.

In the survey by the Cotton Ginning Laboratory of drying operations in new gins, 63 percent of which had driers, it was found that an average of 88 percent of the cotton ginned by them was conditioned prior to ginning. The reports from ginners showed average ginning capacity increases of over 20 percent on the moist cotton and about 5 percent on the dry cotton, which were attributable to the handling of the seed cotton in the conditioning and drying units. Based on these reports, bale value was increased an average of almost $4 for green, damp, or wet cotton and $1 for dry cotton as a result of conditioning and cleaning the cotton and improving its grade. The fuel costs for the different heating units averaged 15 cents per bale. Various sources of heat were used in the drying outfits of the new plants. Over half of them were equipped with gas-fired furnaces; one-third employed steam to provide the heat; eight percent had engine waste heat recovery units; and 6 percent had oil-burning furnaces.

In addition to receiving dry seed cotton at the gin, or conditioning it there to assure dryness, a cotton gin must have apparatus for cleaning and extracting, gin stands in first-class shape, means for maintaining purity of seed to be saved for planting purposes, and good baling or packaging machinery.

The need for cleaning and extracting differs widely in different regions. Where this operation is not burdened with excessive trash or rough harvested cottons, it can be performed in one machine at the time when the seed cotton is fed into the gin stands. This machine is an individual cleaner-extractor-feeder which should replace the obsolete drum feeder, many of which still remain in use at the cotton gins. The new extractor-feeders seldom require any more power to operate, but they are so much more effective that they frequently more than double the quantity of foreign matter removed, in comparison to the drum feeders. "Extracting", as such, employs a carding and beating action without screens so that it removes large pieces of foreign matter as well as performing excellent separation of the finer particles such as are screened out in cleaners. Thus, the "extracting" processes are preferable to "cleaning" because they remove more kinds of foreign matter.

Surveys made by the U. S. Cotton Ginning Laboratory at new ginning establishments in this country indicated that almost all of them had feeders of the extractor-cleaner type. Only about two-thirds of the older gins had this type of feeder.

Immediately following the drying and cleaning processes, as regards importance in better ginning for higher quality, are the gin stands themselves. An outstanding contribution to good ginning in the new plants of the country is the high speed (600 to 700 revolutions per minute) at which gin saws are now operating to provide looser seed rolls. Loose-roll ginning in every gin should be the goal of the American cotton industry. Probably no single ginning element is more important. Its attainment is based upon initial requisites of dry, clean cotton and careful operation of the gin. In 1940, 96 percent of the new gins were found to be operating with loose seed rolls, as compared to less than two-thirds of the older gins studied. Many of the older gins are now being rapidly modernized to higher saw speeds, averaging 516 revolutions per minute, in comparison to an average of about 600 revolutions per minute for all the new representative gins surveyed. Of the older gins which stepped-up their saw speeds, 9 percent increased their speeds from 440 to 542 revolutions per minute. In regard to the relative size of the new outfits, it is interesting to note that of the new gins surveyed 40 percent had 4 stands, 40 percent had 3 stands, 8 percent had 2 stands and the remainder had 5 stands.

The ginning industry is farily well informed as to the degree of fineness and shape saw teeth should have to give the best all-around performance in capacity, turnout and lint quality. For 12-inch saws, the 264 straight-back teeth and the 280-290 modified roach-back teeth have been found to be the leaders. New gins are being factory-equipped with such saws, and older gins are being fitted with them during modernization.

In addition to good saws, the cotton gins must have first-class ribs, good doffing apparatus (brush or airblast) and properly maintained interior elements in the gin stands, such as metal dividing and wind boards, good mote boards, bearings and drives. The gin stands should be free from vibration.

Maintaining the purity of planting seed is another contribution which the modern cotton gin can make toward cotton improvement. Over one-third of the new gins examined by this laboratory in its representative surveys had systems for handling pure seed at the gins, and a surprising number of gins which are being modernized are including such systems. These may be either mechanical or pneumatic. Mechanical systems for maintaining purity of seed may be either self-cleaning belts, or (in two-story gins) may have seed conveyor troughs which can be quickly cleaned through hinged bottoms and which deliver the seed to a self-cleaning rotary feeder and thence into a blowing line. Pneumatic pure-seed systems may have individual rotary sealed feeders beneath each gin stand, delivering the seed into a self-cleaning blow pipe, or they may use a belt to convey seed from beneath the gins to such a blow pipe. It is now possible, with pressure blowers instead of fans, to convey seed several hundred feet in relatively small pipes. Thus, a new pressure system using five-inch pipes to handle the entire output from a 5/80 gin outfit blows the seed six or seven hundred feet with ten horsepower; in comparison, the older and less efficient fan systems use 12-inch pipe and require about 25 horsepower for the fan.

Improvements are also possible in many cotton gins with respect to the auxiliary equipment, such as fans and piping, driving shafts and bearing, arrangements and controls--all of which may contribute to greater economy and better ginning. Reducing power waste in operating cotton gins may mean the difference between profit and loss to the ginner.

Mention should be made of the roller gins which, although few in number, are needed to gin the long-staple cotton of the American-Egyptian and Sea Island types. These gins use covered rollers instead of saws. According to the ginners' estimates, one-third of the cotton these roller gins receive each season is damp and over three-fourths is trashy. These conditions present to operators of roller gins the same problems in drying, cleaning and extracting as are faced by operators of saw gins, but these problems are magnified in proportion to the greater difficulties of handling such long staples. Much is needed and is being done in roller ginning improvements, due to increased plantings of the improved American-Egyptian cottons of the SXP variety in the Southwest. Better roll coverings are being developed by the technologists and engineers at the United States Cotton Ginning Laboratory, and improved mechanical designs of gin stands are coming from the manufacturers. However, much remains to be done in this field, and the specialists in the United States Department of Agriculture are hard at work upon roller-gin problems.

At all gins, the handling and pressing of the ginned lint are open to improvement. New gins are commonly equipped with better forms of condensers and presses, compress bales to somewhat higher densities, turn out neater packages, and the operators give more attention to identification which eliminates harmful markings and use of damaging coatings on ties. Four-fifths of the new gins have all-steel presses, a majority of which are of the down-packing kind. Five-sixths of the new gins studied were found to have either side- or down-draft condensers, instead of the older forms of up-draft units. The outstanding advantages of these newer types are their superior self-cleaning performance and the uniformity of delivery to the press box resulting in decreasing the number of big-ended or rolling bales which are objectionable to the trade.

A final recapitulation of the benefits from modernization of cotton gins and the employment of better methods and practices in ginning and its allied processes will be of interest. These benefits, when taken in their entirety, do not, of course, comprise the sum total of the individual gains, but one or more of them may apply to any bale of cotton.

A resume of some advantages which modernization can produce is as follows:

1. Conditioning and drying benefits alone may range from 70 cents per bale on short cottons to $2.50 per bale on long staples.

2. Increasing saw speeds from 400 to 600 r.p.m. and loose-roll ginning increase ginning capacity as much as 20 percent, add an average of more than one percent to lint turnout, and give an average bale-value increase of $1.50 to $2.50 for short- and long-staple cottons, respectively.

3. Repairing brushes or nozzles prevents losses often ranging from 80 cents to $1.00 or more per bale.

4. Extractor-feeders show an average bale-value increase of $1.00 or more over huller fronts or plain feeders.

5. Using saws with 264 straight teeth or 280-290 modified roach-back teeth has shown an average bale-value increase of from 50 cents to $1.75 per bale on long-staple cottons, as compared to results obtained with saws of 264 roach teeth.

6. Improved fans, piping, drives and other "power-waste eliminators" in some instances have reduced power costs almost one-half, and in all instances have been beneficial.